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PATENT APPLICATION

Inventor: Robert Hughes Jones Docket No.: 2137JB.45700

MONITORING A MICROSEISMIC EVENT

Cross-Reference to Related Application

[0001] This application claims the benefit of United Kingdom Patent Application No.0224439.0, filed on October 21, 2002, which hereby is incorporated by reference in its entirety.

Technical Field of the Invention

[0002] The present invention relates to monitoring a microseismic event.

Background of the Invention

[0003] Microseismic data is continuously received from microseismic sensors fitted in producing fluid wells, such as hydrocarbon producing fluid wells. Triggering algorithms are an important aspect of microseismic monitoring in. that they are the mechanism by which the microseismic signals are detected, Algorithms are required that can discriminate between background noise, that may vary with time, and microseismic signals, that may also vary between events. The algorithm runs in real-time and so simplicity of computation is also an advantage.

[0004] Microseismic monitoring in producing fluid fields, for example oil fields, may mean monitoring in the presence of high levels of electrical noise. One source of electrical noise conies from the use of electrical currents for cathodic protection, particularly of the items in a well borehole. The cathodic protection current is DC, which is typically derived from an AC mains

supply by rectification. This leads to a DC current that contains frequency peaks typically at 50 Hz, 100 Hz., etc. This large, peaky current invariably finds its way into the electrical outputs of the sensors and can make finding microseismic signals difficult,

[0005] There are several types of well known existing seismic triggers. The simplest is just the detection of a signal level change. A more sophisticated trigger is to look for a level change that occurs across several separate stations within a pre-defined time window, Another variation on this is to use a long term-short term average to cause a trigger. This is just the short-term average of a rectified signal divided by the long-term average of the rectified signal. The ratio of long-term to short-term is typically around a factor of nine.

[0006] In the presence of the multi-frequency noise described above, neither of the trigger algorithms described in the previous section is effective. What is required is an accurate model of the noise that, although it is well characterised locally, does change over time.

Summary of the Invention

[0007] According to the present invention, there is provided a method of monitoring a microseismic event, comprising: detecting said event to produce a first signal dependent on said event, the first signal including noise at a frequency of f Hz; taking a first sample of said first signal; taking a second sample of said first signal, the second sample occurring n/f seconds after the first sample, where n is an integer; and subtracting the first and second samples from each other to produce a further signal dependent on said event in which said noise has been at least partly compensated for.

[0008] The integer could be 1.

[0009] The frequency fHz could be 50 Hz for example, or a harmonic of 50 Hz.

[0010] The method could be one in which the microseismic event is one occurring in a fluid producing well.

Description of the Preferred Embodiment

[0011] In one example, although the noise contains all harmonics of, typically, 50 Hz, it has been found that by subtracting the current sample from a sample that occurred 20 milliseconds before, typically well over 90% of the noise energy is removed. An existing trigger detection algorithm can then be used and levels of detection become similar to those that are achieved when no noise is present. This approach works because all the noise spikes are harmonics of the typically 50 Hz fundamental, which is a property of the rectification process that is used in creating the DC.